

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. **Claim 1** is rejected under 35 U.S.C. 102(b) as being anticipated by Furuno et al. (US 2003/0019917 A1).

a. **Regarding claim 1**, Furuno et al. discloses a soldering method comprising the steps of:

- i. reducing the pressure of a vacuum room with a workpiece therein, said workpiece having solder thereon in the solid state consisting of tin and lead [fig. 5A; paragraphs 35-40, 218-219];
- ii. thereafter, generating a free-radical gas in said vacuum room to remove an oxide film on said solder [paragraph 61; claim 2]; and
- iii. stopping the generation of said free-radical gas to said vacuum room to make the atmosphere in said vacuum room non-oxidizing, and raising the temperature of said solder to a temperature above the melting

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point of said solder to thereby cause said solder to melt [paragraphs 302-307; claim 6].

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. **Claims 1-3** are rejected under 35 U.S.C. 103(a) as being obvious over Paik et al. (US 5352629) in view of Suga et al. (US 2004/0007610 A1).

b. **Regarding claim 1**, Paik et al. discloses a soldering method comprising the steps of:

- iv. reducing the pressure of a vacuum room with a workpiece therein, said workpiece having solder thereon in the solid state consisting of tin and lead [col. 3, lines 30-40 & col. 4, lines 44-52]
- v. generating hydrogen in said vacuum room to remove an oxide film on said solder [col. 4, line 46]. Paik is silent as to the hydrogen being in

the form of a free-radical gas. However, Suga (drawn to reflow soldering method) discloses that a hydrogen free radical gas obtained from a hydrogen plasma exerts reducing action on the oxides and forms solder bumps without leaving a flux residue [paragraphs 11-15]. It would have been obvious to a person of ordinary skill in the art of soldering to substitute the hydrogen of Paik by the free radical hydrogen gas of Suga in order to remove oxides without the formation of harmful flux residues [paragraphs 11-15].

vi. pumping out the hydrogen before reflowing is equivalent to stopping the generation of said free-radical gas to make the atmosphere in said vacuum non-oxidizing, and raising the temperature of said solder to a temperature to melt the solder.

c. **As to claims 2-3**, Paik discloses fixing the solder in a recess of a workpiece [fig. 2] by the use of a flux [col. 3, lines 30-34].

7. **Claim 1** is rejected under 35 U.S.C. 103(a) as being obvious over Miyazaki (JP 59-225880, referring as JP '880).

d. **Regarding claim 1**, JP '880 discloses a vacuum brazing method comprising the steps of:

- vii. reducing the pressure of a vacuum room with a workpiece therein, said workpiece having a brazing material thereon in the solid state [fig. 1];
- viii. subjecting the workpiece to ion bombardment by high voltage in said vacuum room to remove an oxide film [abstract]. The bombarding

ions are analogous to a free-radical gas since both are alternate forms of ionized gas generated in plasma by the application of strong radio frequency or microwave frequency.

ix. stopping the high voltage and ion bombardment of said free-radical gas to make the atmosphere in said vacuum non-oxidizing, and raising the temperature to braze the assembly [page 4].

x. JP '880 does not explicitly disclose the above steps for a soldering method. However, it would have been obvious to a person of ordinary skill in the art to apply the known ion bombardment technique of JP '880 in a soldering method in order to yield a predictable result of more efficient oxide removal and soldering in a continuous chamber for increased productivity [pg. 2, lines 11-24 & pg. 5, lines 8-30].

8. **Claims 1-3** are rejected under 35 U.S.C. 103(a) as being unpatentable over Suga et al. (US 2004/0007610 A1) in view of Steinhelper (US 3461458).

e. **Regarding claim 1**, Suga et al. discloses a soldering method comprising the steps of:

xi. reducing the pressure of a vacuum room with a workpiece therein, said workpiece having solder thereon in the solid state [fig. 1; paragraphs 14 & 35];

xii. thereafter, generating a free-radical gas in said vacuum room to remove an oxide film on said solder [paragraph 10]; and

- xiii. Suga discloses an electrically grounded shield to trap the hydrogen ions in order to prevent them from reaching substrate 30 [paragraph 36], but fails to disclose stopping the free-radical gas. However, Steinhelper (drawn to joining two surfaces by soldering) discloses hydrogen flow for reducing the oxides on the surfaces of the components and then stopping the flow, & drawing vacuum to prevent large pressure differential across the molten solder and any bubbling through the solder. It would have been obvious to a person of ordinary skill in the art to stop the hydrogen flow as taught by Steinhelper in the process of Suga because such would prevent any bubbling through the solder and eliminate resulting blow holes/voids [col. 2, lines 30-44].
- f. **As to claims 2-3**, Suga discloses fixing the solder in a recess of a workpiece [fig. 2] by the use of a flux [paragraph 22].

Information Disclosure Statement

9. The information disclosure statement (IDS) submitted on 8/10/06 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Conclusion

Claims 1-3 are rejected.

The rejections above rely on the references for all the teachings expressed in the text of the references and/or one of ordinary skill in the art would have reasonably understood from the texts. Only specific portions of the texts have been pointed out to emphasize certain aspects of the prior art, however, each reference as a whole should be reviewed in responding to the rejection, since other sections of the same reference

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and/or various combinations of the cited references may be relied on in future rejections in view of amendments.

Applicant is reminded to specifically point out the support for any amendments made to the disclosure. See 37 C.F.R. 1.121; 37 C.F.R. Part 41.37; and MPEP 714.02.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DEVANG PATEL whose telephone number is (571)270-3636. The examiner can normally be reached on Monday thru Thursday, 8:00 am to 5:30 pm, EST..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on 571-272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DP

/Jerry A Lorengo/
Supervisory Patent Examiner, Art Unit 1793